ISSN 0704-3716

Canadian Translation of Fisheries and Aquatic Sciences

No. 5479

Summary of anadromous salmonid propagation in the North Pacific rim nations

S. Urawa and M. Kaeriyama

Original title: Kitataiheiyo ni okeru sake - masu no zoshoku

In: Fish and Eggs 156: 26-35, 1986
Sakana to Tamago 156: 26-35, 1986

Original language: Japanese

Available from:
Canada Institute for Scientific and Technical Information
National Research Council
Ottawa, Ontario, Canada K1A 0S2

1989

15 typescript pages

Secretary of State / Secrétariat d'État

90-00587/

MULTILINGUAL SERVICES DIVISION – DIVISION DES SERVICES MULTILINGUES

TRANSLATION BUREAU BUREAU DES TRADUCTIONS

LIBRARY IDENTIFICATION – FICHE SIGNALÉTIQUE

Translated from - Traduction de	Into - En
Japanese	English

Author - Auteur

Shigehiko URAWA and Masahide KAERIYAMA

Title in English or French – Titre anglais ou français

Summary of anadromous salmonid propagation in the North Pacific rim nations

Title in foreign language (Transliterate foreign characters)
Titre en langue étrangère (Transcrire en caractères romains)

Kitataiheiyo ni okeru Sake - Masu no Zoshoku

Reference in foreign language (Name of book or publication) in full, transliterate foreign characters.
Référence en langue étrangère (Nom du livre ou publication), au complet, transcrire en caractères romains.

Sakana to Tamago

Reference in English or French - Référence en anglais ou français

Fish and Eggs

Publisher - Éditeur	DATE OF PUBLICATION / DATE DE PUBLICATION			Page Numbers in original / Numéros des pages dans l'original
	Year / Année	Volume	Issue No. / Numéro	pp. 25-35
Place of Publication / Lieu de publication	Dec. 1986	Reprint	of No. 156	Number of typed pages / Nombre de pages dactylographiées: 13

Requesting Department / Ministère-Client: DFO

Translation Bureau No. / Notre dossier nº: 3511642

Branch or Division / Direction ou Division: Sci. Pub.

Translator (Initials) / Traducteur (Initiales): PS

Person requesting / Demandé par: Heather Cameron

SEP 12 1989

Your Number / Votre dossier nº:

Date of Request / Date de la demande: 27 July 1989

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Canada

SEC 5-111 (84-10)

Department of the Secretary of State of Canada | Secrétariat d'État du Canada

MULTILINGUAL SERVICES DIVISION – DIVISION DES SERVICES MULTILINGUES

TRANSLATION BUREAU | BUREAU DES TRADUCTIONS

Client's No.–N° du client	Department – Ministère	Division/Branch – Division/Direction	City – Ville
	DFO	Sci. Pub.	Ottawa, Ont.
Bureau No.–N° du bureau	**Language – Langue**	**Translator (Initials) – Traducteur (Initiales)**	
3511642	Japanese	PS	SEP 12 1989

Summary of anadromous salmonid propagation in the North Pacific rim nations

by

Shigehiko URAWA and Masahide KAERIYAMA
(Hokkaido Salmon Hatchery)

The "Salmon Forum 86" symposium was held in Sapporo in early September 1986 for the purpose of considering the future of the salmonid breeding industry. The present data were compiled by using basic foreign data provided at the time and supplemented with later information.

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Foreword

Japan built up through artificial breeding huge salmonids resources such as had never been seen in previous history. What is the present situation of salmonid breeding in the other countries located on the North Pacific coasts? How is the Japanese salmonid breeding industry regarded in these countries? As there are not too many data giving a picture of the salmonid breeding industry in the entire North Pacific region, we sought the cooperation of the persons in charge in the various countries, and gathered data about the fishing of catadromous* fish as well as about artificial hatching and releases in the North Pacific area (Table 1). We present here these statistics and would like to use them as material for considering the state of salmonid breeding and the problems faced by the various countries including Japan in the North Pacific region.

The total world fisheries production and the salmonid production

The total world fisheries production increases every year. In 1984, it exceeded 80 million tonnes. In these figures, the production of salmonids tends to show increases. The amount was recently about 800,000 tonnes which corresponds to about 1% of the total volume of marine products. The five species of salmonids from the North Pacific (chum

---

*Translator's note: Sic; the word "catadromous" is kept throughout the text.

Table 1

The Catadromous salmonids bred in the North Pacific

a) Japanese name
   a. 1 Sake
      2 Karafutomasu
      3 Ginzake
      4 Masunosuke
      5 Benizake
      6 Sakuramasu
      7 Suchiruheddo
      8 Kattosuroto

b) English name

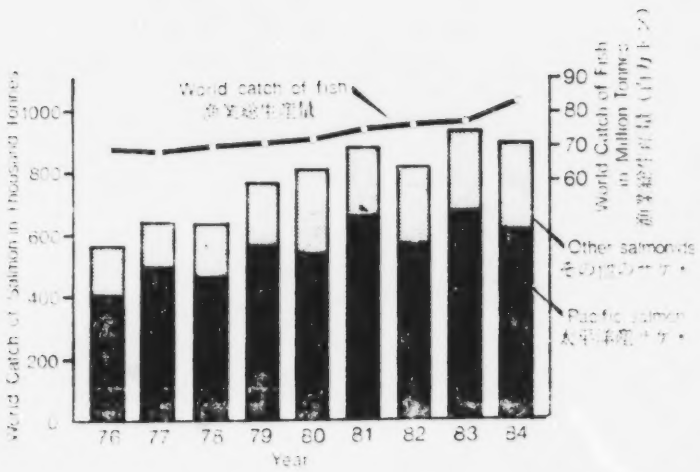
c) Scientific name

d) Code

表1　北太平洋で増殖対象となっている降海性サケ科魚類

	和名 a	英名 b	学名 c	略号 d
1	サケ	Chum salmon	*Oncorhynchus keta*	OKe
2	カラフトマス	Pink salmon	*O. gorbuscha*	OG
3	ギンザケ	Coho salmon	*O. kisutch*	OKi
4	マスノスケ	Chinook salmon	*O. tshawytscha*	OT
5	ベニザケ	Sockeye salmon	*O. nerka*	ON
6	サクラマス	Masu salmon	*O. masou*	OM
7	スチールヘッド	Steelhead trout	*Salmo gairdneri*	SG
8	カットスロート	Cutthroat trout	*S. clarki*	SC

salmon, pink salmon, sockeye salmon, chinook salmon and coho salmon) represent from 65% to 76% of the salmonids produced in the world (Fig. 1). /27



UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Fig. 1: Total world fisheries production volumes and salmonids production volumes
Data: FAO (1986); Ocean Fisheries Research Station (1986)

Numbers of fish caught by species of North Pacific salmonid /28

If we consider the average annual numbers of salmonids caught from 1979 to 1983 in the North Pacific and off the coastal countries, we see that the pink salmons are most numerous. About half of these are caught on the Asia side and about the other half on the North-American side. The sum is 169.4 million fish caught and represents 60% of the total (42% in weight). Chum salmon represents 48.7 million fish caught (18%) of which 58% is caught along the coasts and in the rivers of Japan. Sockeye salmon represents 44.5 million fish caught (16%) of which 81% is caught off Alaska. Up to 76% of the 11.7 million coho salmon caught and up to 83% of the 4 million chinook salmon caught are captured in North America (Fig. 2).

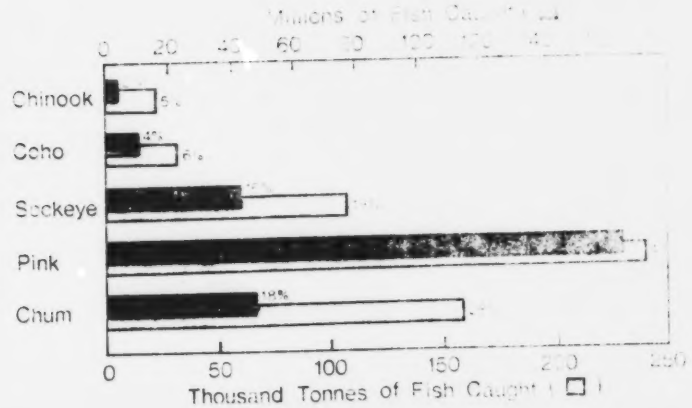


Fig. 2: Amounts of salmonid catch and numbers of fish caught by species in the North Pacific and coastal areas (1979-1983 averages)
Data: Ocean Fisheries Research Station (1986)

The types bred by the various countries of the North Pacific rim /29

There are 8 types of catadromous salmonid hatched and released artificially in the North Pacific area, that is, Chum salmon, Pink salmon, Coho salmon, Chinook salmon, Sockeye salmon, Masu salmon, Steelhead trout (catadromous rainbow trout), Cutthroat trout (Table 1). The main salmonid - releasing countries are the US, Canada, the Soviet Union and Japan. In all cases, the breeding activities are centered on public national hatcheries. South Korea releases Chum salmon fry from small-scale state-run hatcheries. China is conducting trial Chum salmon, Pink salmon, Masu salmon breeding at the Song Huajiang tributory of the Hei Longjiang river (Fig. 3).

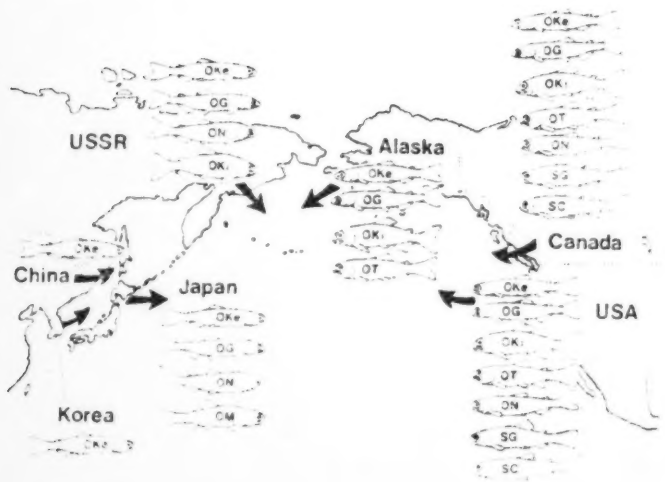


Fig. 3: Catadromous salmonid species bred by the various countries on the Pacific rim
Data: Hansen (1986), Kirby (1985), Konovalov (1980), SEP (1985), Wahle and Smith (1979)

The total quantity of released anadromous salmonids /30

The total number of artificially hatched and released salmonids, excepting the naturally produced catadromous fish, in the North Pacific area was about 700 millions in 1960. The number increased sharply thereafter, and is estimated to have exceeded 5 billions in 1985. At the beginning, the increase in released fry was centered on the breeding operations of Japan and the Soviet Union. In recent years, the numbers of releases have tended to increase in the US and Canada which established new increase plans for salmonids (Fig. 4).

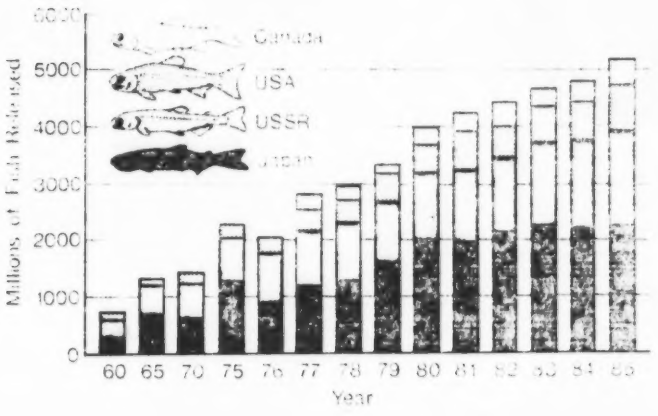


Fig. 4: Total numbers of catadromous salmonid fry released in the North Pacific coastal areas

(the Soviet Union figures regarding the number of releases from 1976 are based on estimations by McNeil (1977a, 1977b); the estimations may greatly exceed the actual figures)

a) data
b) Hokkaido salmonid hatcheries (1961-1986)
c) Fisheries Agency, Promotion Dpt., Promotion Section

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Numbers of catadromous salmonid releases per species /31

If we compare the numbers of artificially hatched and released fry per species for 1975 and 1985, we note increases for all species. The number of Chum salmon releases increased vastly. In 1985 the approximative 3.3 billion number of Chum salmon fry releases amounted to 65% of the total. Pink salmon comes next in number of releases. While the two above species are released in great numbers by the Soviet Union and Japan, most of the Chinook salmon, Sockeye salmon, Coho salmon which require long-term rearing prior to release, are reared and released in North America. The figure for Sockeye salmon releases is near 200 millions. Release of this species is carried out mainly by Canada. Aside from this, the same country produces about 300 million Sockey salmons through free fattening in lakes. About 4 million Masu salmon fry are released by Japan (Fig. 5).

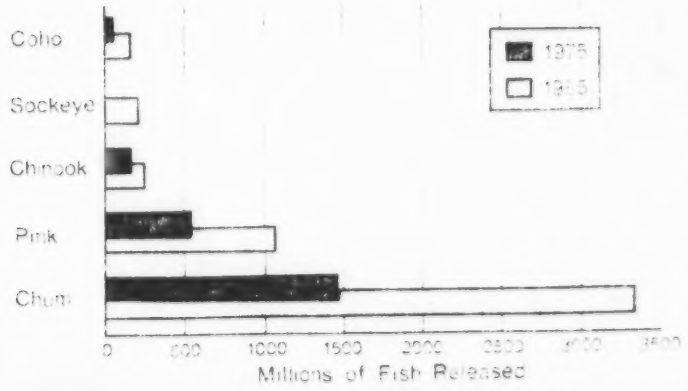


Fig. 5: Numbers of catadromous salmonid releases per species in the North Pacific area

a) data

Conclusion /32

Salmonids represent barely 1% of the world total fisheries production. It would seem however that if one consider the demand, their value is much higher than reflected in the above figure. The volume of salmonids caught in the Pacific represents about 70% of the total salmonid catch so that on a world scale too, it represents very valuable fisheries resources (Fig. 1).

Artificial breeding of Pacific salmonids has been carried out from the second half of the 19th century, but it is only recently that the number of releases has increased by a leap. The total number of catadromous salmonid releases in the North Pacific has increased every year, and it is estimated that more than 5 billions were released in 1985 (Fig. 4). If such increase is maintained, one may imagine that the release figure would exceed 10 billions in the year 2,000 (Mahnken et al., 1985), and all kinds of problems might arise in the future regarding artificial hatching and releases. In Japan, the purpose of breeding is to create fisheries resources while the US and Canada consider the safety of natural stocks to be important, so artificial breeding of salmonids is carried out for reasons of restoration-protection. It is therefore feared that the increasing artificial hatching and release might interfere with the natural stocks (Lannan, 1980). It seems that at the present time the proportion of artificially hatched and released salmonids is not too high in the volume of salmonid stocks, and the volume of salmonid stocks is not reported to exceed the total accomodating capacity of the North Pacific. However, as the various fish

species and individual schools are distributed in areas which to a certain extent are determined areas during the salmonids life periods in the ocean, one may anticipate that changes could occur in parts of the ecological systems inside the distribution areas and that there might be some interference between species and even within the same species if specific species and particular schools are increased through artificial breeding. Several phenomena indicating such possibilities have already been reported (Peterman, 1980; Rogers 1982; Takagi et al. 1981; Kaeriyama 1985). As the released salmonids are distributed throughout wide areas where they pursue their great North Pacific migrations, they live in the company of salmonids from various countries. This is why some kind of international consensus might become necessary with regard to artificial hatching and release of salmonids.

In the gathering of data about salmonid breeding, we received the cooperation of the following persons. We are grateful to them for their help.

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Mr. Wesley J. Ebel (Director, CZES Division, Northwest and Alaska Fisheries Center, Coastal Zone and Estuarine Studies Division, Seattle, Washington, USA)

Dr. Robert W. Foster (State of Washington, Department of Fisheries, Washington, USA)

Mr. Tom Krom (Chief of Operations, State of Alaska, Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development (FRED), Alaska, USA)

1 石田行正博士（水産庁遠洋水産研究所北洋資源部）

2 石黒武彦氏（水産庁北海道さけ・ますふ化場企画課）

3 紀 栄興氏（中華人民共和国厦門水産学院）

Dr. Leo Margolis (Head, Fish Health and Parasitology Section, Pacific Biological Station, Department of Fisheries and Oceans, B.C., Canada)

4 真山 紘氏（水産庁北海道さけ・ますふ化場調査課）

Mr. Harold Swan (Acting Director, Salmonid Enhancement Program, Department of Fisheries and Oceans, B.C., Canada)

5 奈良俊和氏（水産庁振興部振興課）

Mr. Harry Wanger (Chief of Fisheries, Department of Fish and Wildlife, Portland, Oregon, USA)

Mr. Eigar Wold (Deputy Division Chief, United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Environmental and Technical Services Division, Portland, Oregon, USA)

1. Dr. Yukimasa ISHIDA (Fisheries Agency, Ocean Fisheries Research Station, Northern Seas Stocks Research)

2. Takehiko ISHIGURO (Fisheries Agency, Hokkaido Salmonid Hatcheries Planning Section)

3. Ji Jungxing (People's Democratic Republic of China, Fisheries Information Institute)

4. Hiroshi MAYAMA (Fisheries Agency, Hokkaido Salmonid Hatcheries Survey Section)

5. Toshikazu NARA (Fisheries Agency, Promotion Dpt., Promotion Section)

Bibliography

Castoldi, P. 1983. Wash. Dep. Fish. Prog. Rep. No. 185. 380p.

Castoldi, P. and T. Rasch. 1982. Wash. Dep. Fish. Prog. Rep. No. 160. 359p.

Coleman, P. and T. Rasch. 1981. Wash. Dep. Fish. Prog. Rep. No. 132. 360p.

1 遠洋水産研究所. 1986. さけ・ますの資源状態に関する資料（1986年度予測）. サケマス調査研究資料 28: 1-239.

FAO. 1986. Yearbook of Fishery Statistics 1984.

Hansen, J.A. 1986. FRED 1985 annual report to the Alaska State legislature. No. 59. 91p.

Hill, P.M. 1984. Wash. Dep. Fish. Prog. Rep. No. 210. 369 p.

2 帰山雅秀. 1985. 気仙沼大川における回帰サケ親魚の小型個体の増加. 東京大学海洋研究所大槌臨海研究センター報告（11）: 65-66.

Kirby, L.L. 1985. Wash. Dep. Fish. Prog. Rep. No. 231. 380 p.

Konovalov, S.M. 1980. U.S.S.R.: salmon ranching in the Pacific, p. 63-39. In J.E. Thorpe (ed.), Salmon Ranching. Academic Press, London. 441 p.

Lannan, J.E. 1980. Salmom ranching in Oregon, p. 47-62. In J.E. Thorpe (ed.), Salmon Ranching. Academic Press, London. 441p.

Mahnken, C.V.W., D.M. Damkaer and V.G. Wespestad. 1985. Perspetives of North Pacific salmon sea ranching. US Depertment of Commerce, National Marine Fisheries Service: 186-216.

McNeil, W.J. 1977a. Artificial recruitment of pink and chum salmon in Japan and eastern USSR. US Depertment Commerce Processed Rep., Northwest and Alaska Fisheries Center, Seattle. 13p.

McNeil, W.J. 1977b. Artificial recruitment of Pacific salmon in Japan, Republic of Korea, and the Soviet Union. US Depertment Commerce Rrocessed Rep., Northwest and Alaska Fisheries Center, Seattle. 38p.

Peterman, R.M. 1980. Testing for density-dependent marine survival in Pacific salmonids, p. 1-23. In W.J. McNeil and D.C. Himsworth (eds.), Salmonid Ecosystems of the North Pacific. Oregon State Univ. Press, Corvallis, Oregon. 331p.

Rogers, D.E. 1980. Density-dependent growth of Bristol Bay sockeye salmon, p.267-283. In W.J. McNeil and D.C. Himsworth (eds.), Salmonid Ecosystems of the North Pacific. Oregon State Univ. Press, Corvallis, Oregon. 331p.

SEP. 1985. 1984 Annual Report Summary. Salmonid Enhancement Program, Department of Fisheries and Oceans, Vancouver, B.C., Canada. 20p.

3 水産庁北海道さけ・ますふ化場. 1961-86. 事業成績書.

4 水産庁振興部振興課. 1976-1986. 本州地域さけ・ますふ化放流事業成績書.

Takagi, K., K.V. Aro, A.C. Hartt and M.B. Dell. 1981. Distribution and origin of pink salmon (*Oncorhynchus gorbuscha*) in offs e waters of the Norsh Pacific Ocean. Int. North. Pac. Fish. Comm. Bull. 40: 1-195.

Wahle, R.J. and R.Z. Smith. 1979. A historical and descriptive account of Pacific coast anadromous salmonid rearing facilities and a summary of their releases by region, 1960-76. NOAA Tech. Rep. NMFS SSRF-736: 1-40.

1. En'yo Suisan Kenkyusho (Ocean Fisheries Research Station) 1986 Sake-masu no shigen jotai ni kansuru shiryo (1985 nendo yosoku). Sake-masu chosa kenkyu shiryo (Data on the salmonid stocks (1986 forecasts). Salmonid survey research data) 28: 1-239

2. Masahide KAERIYAMA 1985 Kesennuma Okawa ni okeru Kaiki sake shingyo no kogatakotai no zoka (The increase in small migratory Chum salmon parent fish in Kesennuma Okawa) Tokyo University Marine Research Center, Otsuchi Seaside Research Center Report (11): 65-66

3. Fisheries Agency, Hokkaido Salmonid Hatcheries, 1961-86 Jigyoseisekisho (Records of Achievements)

4. Fisheries Agency, Promotion Dpt., Promotion Section, 1976-1986 Honshu Chiiki Sake - Masu Fukahoryu Jigyo Seisekisho (Records of achievements in hatching and release of salmonids in Honshu)